JOURNAL OF
CELLULAR PHYSIOLOGY

A WISTAR INSTITUTE PRESS JOURNAL PUBLISHED BY ALAN R. LISS, INC.

VITTORIO DEFENDI, *Editor-in-Chief*
New York University Medical Center • Department of Pathology
550 First Avenue • New York, New York 10016

EDITORS

RENATO BASERGA
Temple University

PHILIP I. MARCUS
niversity of Connecticut

FREDERICK MAXFIELD
Columbia University College of Physicians and Surgeons

E.A. McCULLOCH
Ontario Cancer Institute

HAROLD L. MOSES
Vanderbilt University

DANIEL RIFKIN
New York University

P. SIEKEVITZ
The Rockefeller University

KENNETH M. YAMADA
National Cancer Institute

ASSOCIATE EDITORS

HN W. ADAMSON
niversity of Washington

ENTER ALBRECHT-BUEHLER
Northwestern University

AUDIO BASILICO
New York University

WRENCE A. CHASIN
Columbia University

TEPHEN C. CLARK
Genetics Institute

AVID CLEMMONS
University of North Carolina at Chapel Hill

TANLEY COHEN
Vanderbilt University School of Medicine

VINCENT J. CRISTOFALO
The Wistar Institute

DENNIS D. CUNNINGHAM
University of California at Irvine

LAWRENCE E. HIGHTOWER
University of Connecticut

ERIC A. JAFFE
Cornell Medical Center

ARNOLD J. LEVINE
Princeton University

VICTOR LING
Ontario Cancer Institute

GEORGE M. MARTIN
University of Washington

M.L. MENDELSOHN
Lawrence Livermore Laboratory

DONALD METCALF
Walter and Eliza Hall Institute

G.K. MICHALOPOULOS
Duke University Medical Center

IRA PASTAN
National Cancer Institute

P.G.W. PLAGEMANN
University of Minnesota

RUSSELL ROSS
University of Washington

GIOVANNI ROVERA
The Wistar Institute

ENRIQUE ROZENGURT
Imperial Cancer Research Fund Laboratories

ERIC STANBRIDGE
University of California at Irvine

E. RICHARD STANLEY
Albert Einstein College of Medicine

GARY S. STEIN
University of Massachusetts Medical Center

CHARLES D. STILES
Dana-Farber Cancer Institute

INDER M. VERMA
The Salk Institute

JAN T. VILCEK
New York University Medical Center

MITCHEL VILLEREAL
University of Chicago

MARLENE CHAVIS, *Editorial Manager*
New York University Medical Center

COPYRIGHT © 1989 BY ALAN R. LISS, INC.
All Rights Reserved

VOLUME 139
APRIL, MAY, JUNE 1989

Contents

No. 1 APRIL 1989

ANNAROSA ARCANGELI, MARIA RICCARDA DEL BENE, RICCARDO POLI, LETIZIA RICUPERO, AND MASSIMO OLIVOTTO. Mutual Contact of Murine Erythroleukemia Cells Activates Depolarizing Cation Channels, Whereas Contact With Extracellular Substrata Activates Hyperpolarizing Ca^{2+}-Dependent K^+ Channels 1

MASAMICHI HIRAI AND NOBUYOSHI SHIMIZU. Stimulation of a MR 80,000 Protein Phosphorylation by EGF in EGF Receptor-Hyperproducing Human Tumor Cells 9

MASAAKI TATSUKA, SATOSHI ORITA, AND TAKEO KAKUNAGA. Analysis of Cell Variants Showing Differential Susceptibilities to Radiation- or Chemical-Induced Neoplastic Transformation: Differences in Their Responses to Growth Factors 18

SVEN JOHAN HYLLNER, TOMMY ANDERSSON, CARL HAUX, AND PER-ERIC OLSSON. Cortisol Induction of Metallothionein in Primary Culture of Rainbow Trout Hepatocytes 24

RONALD M. BURCH, MARSHA F. WHITE, AND JANE R. CONNOR. Interleukin 1 Stimulates Prostaglandin Synthesis and Cyclic AMP Accumulation in Swiss 3T3 Fibroblasts: Interactions Between Two Second Messenger Systems 29

KEIJI TANAKA, ATSUSHI KUMATORI, KUNIO II, AND AKIRA ICHIHARA. Direct Evidence for Nuclear and Cytoplasmic Colocalization of Proteasomes (Multiprotease Complexes) in Liver 34

DEBORAH BANKER AND HARVEY R. HERSCHMAN. HeLa Cell Mutants Resistant to Epidermal Growth Factor Ricin A-Chain Conjugate 42

DEBORAH E. BANKER, IRA PASTAN, MICHAEL M. GOTTESMAN, AND HARVEY R. HERSCHMAN. An Epidermal Growth Factor-Ricin A Chain (EGF-RTA)-Resistant Mutant and an Epidermal Growth Factor-*Pseudomonas* Endotoxin (EGF-PE)-Resistant Mutant Have Distinct Phenotypes 51

KIMIYOSHI KANNO AND YASUHARU SASAKI. Smooth Muscle Gelsolin and a Ca^{2+}-Sensitive Contractile Cell Model 58

BRYAN J. HOERL AND ROBERT E. SCOTT. Nonterminally Differentiated Cells Express Decreased Growth Factor Responsiveness 68

PAOLO DELL'ANTONE. Ca^{++}-Ionophore-Induced Dissipation of Intracellular Proton Gradients in Rat Thymocytes 76

SUSAN M. KENNEDY, JOYCE L. FLANAGAN, JOHN W. MILLS, AND PETER A. FRIEDMAN. Stimulation by Parathyroid Hormone of Calcium Absorption in Confluent Madin-Darby Canine Kidney Cells 83

AMY M. FULTON, JOHN J. LATERRA, AND CYNTHIA M. HANCHIN. Prostaglandin E_2 Receptor Heterogeneity and Dysfunction in Mammary Tumor Cells 93

MICHAEL W. ROE, JOHN R. HEPLER, T. KENDALL HARDEN, AND BRIAN HERMAN. Platelet-Derived Growth Factor and Angiotensin II Cause Increases in Cytosolic Free Calcium by Different Mechanisms in Vascular Smooth Muscle Cells 100

FERNANDO A. GONZALEZ, AHMED H. AHMED, KEVIN D. LUSTIG, LAURIE ERB, AND GARY A. WEISMAN. Permeabilization of Transformed Mouse Fibroblasts by 3′-0-(4-Benzoyl)benzoyl Adenosine 5′-Triphosphate and the Desensitization of the Process . . . 109

BETZABE M. STANULIS-PRAEGER AND BARBARA A. GILCHREST. Effect of Donor Age and Prior Sun Exposure on Growth Inhibition of Cultured Human Dermal Fibroblasts by all Trans-Retinoic Acid 116

ROBERT J. GILLIES, RAUL MARTINEZ, JUDITH M. SNEIDER, AND PATRICIA B. HOYER. Sphingosine Inhibits Phorbol 12-Myristate 13-Acetate-, but Not Serum-Induced, Activation of Na^+/H^+ Exchange in Mammalian Cells 125

RAUL MARTINEZ AND ROBERT J. GILLIES. Dimethylsulfoxide Modifies the Sensitivity of BALB/C-3T3 Cells to the Activation of Na^+/H^+ Exchange by Phorbol Esters 131

ARLENE R. WECHEZAK, THOMAS N. WIGHT, ROBERT F. VIGGERS, AND LESTER R. SAUVAGE. Endothelial Adherence Under Shear Stress Is Dependent Upon Microfilament Reorganization 136

MARC CHANSON, ROBERTO BRUZZONE, DOMENICO BOSCO, AND PAOLO MEDA. Effects of n-Alcohols on Junctional Coupling and Amylase Secretion of Pancreatic Acinar Cells 147

THOMAS J. STELZNER, J.V. WEIL, AND R.F. O'BRIEN. Role of Cyclic Adenosine Monophosphate in the Induction of Endothelial Barrier Properties 157

MARTIN ZAGARI, MARCY STEPHENS, H. SHELTON EARP, AND BRIAN HERMAN. Relationship of Cytosolic Ion Fluxes and Protein Kinase C Activation to Platelet-Derived Growth Factor Induced Competence and Growth in BALB/c-3T3 Cells 167

CAROL ELY HEPFER, WAYNE A. LITTLE, JAMIE A. HENGST, AND JEROME J. FREED. Expression of Asparagine Independence in Variants of ICR 2A Haploid Frog Cells 175

MARGARET A. CASCIERI, NANCY S. HAYES, AND MARVIN L. BAYNE. Characterization of the Increased Biological Potency in BALB/C 3T3 Cells of Two Analogs of Human Insulinlike Growth Factor I Which Have Reduced Affinity for the 28 K Cell-Derived Binding Protein 181

JAMES H. SMITH AND DAVID T. DENHARDT. Evidence for Two Pathways of Protein Kinase C Induction of 2AR Expression: Correlation With Mitogenesis 189

J. TIM WESTWOOD AND RICHARD A. STEINHARDT. Effects of Heat and Other Inducers of the Stress Response on Protein Degradation in Chinese Hamster and *Drosophila* Cells 196

RIA B. OONK, RUUD JANSEN, AND J. ANTON GROOTEGOED. Differential Effects of Follicle-Stimulating Hormone, Insulin, and Insulin-like Growth Factor I on Hexose Uptake and Lactate Production by Rat Sertoli Cells 210

No. 2 MAY 1989

BRENT V. EDINGTON, SANDRA A. WHELAN, AND LAWRENCE E. HIGHTOWER. Inhibition of Heat Shock (Stress) Protein Induction by Deuterium Oxide and Glycerol: Additional Support for the Abnormal Protein Hypothesis of Induction 219

TADASHI SEGUCHI, AKIHIKO YOSHIMURA, MAYUMI ONO, SATOSHI SHITE, MICHIHIRO KASAHARA, YOSUKE EBINA, WILLIAM J. RUTTER, AND MICHIHIKO KUWANO. Insulin Receptor and Altered Glucose Transport in a Monensin-Resistant Mutant of Chinese Hamster Ovary Cell 229

MAGNUS RAHM, PEI JIN, JANOS SÜMEGI, AND THOMAS SEJERSEN. Elevated c-*fos* Expression Inhibits Differentiation of L6 Rat Myoblasts 237

D. JAMES WILLIAMSON, TREVOR OWENS, AND MARTIN PEARSE. Detection of Colony-Stimulating Factor Messenger RNA in Single T Cells by In Situ Hybridization . . . 245

LYNN L. STOLL AND ARTHUR A. SPECTOR. Interaction of Platelet-Activating Factor With Endothelial and Vascular Smooth Muscle Cells in Coculture 253

GORDON A. JAMIESON, JR., RUTH D. MAYFORTH, MITCHEL L. VILLEREAL, AND VIKAS P. SUKHATME. Multiple Intracellular Pathways Induce Expression of a Zinc-Finger Encoding Gene (EGR1): Relationship to Activation of the Na/H Exchanger 262

HEIDEH FATTAEY, TERRY C. JOHNSON, AND HSIN-HWEI CHOU. Inhibition of DNA Synthesis and Cell Division by a Cell Surface Sialoglycopeptide 269

YAO-FEN CHENG AND RANDALL H. KRAMER. Human Microvascular Endothelial Cells Express Integrin-Related Complexes That Mediate Adhesion to the Extracellular Matrix 275

NEAL S. FEDARKO, MASAYUKI ISHIHARA, AND H. EDWARD CONRAD. Control of Cell Division in Hepatoma Cells by Exogenous Heparan Sulfate Proteoglycan 287

JOHN F. LECHNER, MOIRA A. LAVECK, BRENDA I. GERWIN, AND ELIZABETH A. MATIS. Differential Responses to Growth Factors by Normal Human Mesothelial Cultures From Individual Donors 295

K. YAMAZAKI, R.A. ROBERTS, E. SPOONCER, T.M. DEXTER, AND T.D. ALLEN. Cellular Interactions Between 3T3 Cells and Interleukin-3-Dependent Multipotent Haemopoietic Cells: A Model System for Stromal-Cell-Mediated Haemopoiesis 301

PHUONG LAN TRAN, CHRISTIAN LE PEUCH, AND MICHÈLE BASSET. Effects of Fluorescent Derivatives of TPA on HL60 Cells: Dissociation Between the Differentiation-Induced and Protein Kinase C Activity 313

U. PAULI, J.F. CHIU, P. DITULLIO, P. KROEGER, V. SHALHOUB, T. ROWE, G. STEIN, AND J. STEIN. Specific Interactions of Histone H1 and a 45 Kilodalton Nuclear Protein With a Putative Matrix Attachment Site in the Distal Promoter Region of a Cell Cycle—Regulated Human Histone Gene 320

HIDEYA KURODA, HIROKI NAKAYAMA, MIKIO NAMIKI, KEISHI MATSUMOTO, YOSHITAKE NISHIMUNE, AND YUKIHIKO KITAMURA. Differentiation of Germ Cells in Seminiferous Tubules Transplanted to Testes of Germ Cell-Deficient Mice of W/W^v and SI/SI^d Genotypes 329

P.L. OLINGER, C.W. BENJAMIN, R.R. GORMAN, AND J.A. CONNOR. Cyclic AMP Can Partially Restore Platelet-Derived Growth Factor-Stimulated Prostaglandin E_2 Biosynthesis, and Calcium Mobilization in EJ-*ras*-Transformed NIH-3T3 Cells . . . 335

M. WRIGHT AND Y. TOLLON. Regulation of Mitosis Onset and Thymidine Kinase Activity During the Cell Cycle of Physarum Polycephalum Plasmodia: Effect of Fluorodeoxyuridine 346

R.H. RIXON, R.J. ISAACS, AND J.F. WHITFIELD. Control of DNA Polymerase-α Activity in Regenerating Rat Liver by Calcium and $1\alpha,25(OH)_2D_3$ 354

RICHARD SULLIVAN, JOSEPH P. FREDETTE, JULIE L. LEAVITT, ANNE-SOPHIE GADENNE, JAMES D. GRIFFIN, AND ELIZABETH R. SIMONS. Effects of Recombinant Human Granulocyte–Macrophage Colony-Stimulating Factor ($GM\text{-}CSF_{rh}$) on Transmembrane Electrical Potentials in Granulocytes: Relationship Between Enhancement of Ligand-Mediated Depolarizaton and Augmentation of Superoxide Anion (O_2^-) Production 361

BARBARA S. BECKMAN, ARTHUR K. BALIN, AND R.G. ALLEN. Superoxide Dismutase Induces Differentiation of Friend Erythroleukemia Cells 370

DARRELL J. YAMASHIRO, LAURENCE A. BORDEN, AND FREDERICK R. MAXFIELD. Kinetics of α_2-Macroglobulin Endocytosis and Degradation in Mutant and Wild-Type Chinese Hamster Ovary Cells 377

RAYMOND C. HARRIS AND THOMAS O. DANIEL. Epidermal Growth Factor Binding, Stimulation of Phosphorylation, and Inhibition of Gluconeogenesis in Rat Proximal Tubule 383

ALICE P. PENTLAND. Collagen Lattice Effects on Fibroblast Arachidonic Acid Metabolism 392

PETER T.C. HO AND ROBERT W. TUCKER. Centriole Ciliation and Cell Cycle Variability During G_1 Phase of BALB/c 3T3 Cells 398

PAUL J. HIGGINS, MICHAEL P. RYAN, AND PANNA CHAUDHARI. Cytochalasin D-Mediated Hyperinduction of the Substrate-Associated 52-Kilodalton Protein p52 in Rat Kidney Fibroblasts 407

LAURA J. BLOEM, LISA CHEN, WILLIAM H. KONIGSBERG, AND RONALD BACH. Serum Stimulation of Quiescent Human Fibroblasts Induces the Synthesis of Tissue Factor mRNA Followed by the Appearance of Tissue Factor Antigen and Procoagulant Activity 418

THOMAS A. OWEN, DIANNE ROBERT SOPRANO, AND KENNETH J. SOPRANO. Analysis of the Growth Factor Requirements for Stimulation of WI-38 Cells After Extended Periods of Density-Dependent Growth Arrest 424

R.A. Tobey, N. Oishi, and H.A. Crissman. Synchronized Human Diploid Fibroblasts: Progression Capabilities of a Subpopulation That Fails to Keep Pace With the Predominant, Rapidly Dividing Cohort of Cells 432

Yoram Milner, Ephraim Sagi, Rina Timberg, Beno Michel, Philippe Me'te'zeau, and Michel Goldberg. Binding Modes of IgG From Pemphigus Autoimmune Sera Onto Guinea Pig Keratinocytes and the Fate of Bound IgGs 441

No. 3 JUNE 1989

Barrett J. Rollins, Therese M. O'Connell, Gregory Bennett, L. Eugene Burton, Charles D. Stiles, and James G. Rheinwald. Environment-Dependent Growth Inhibition of Human Epidermal Keratinocytes by Recombinant Human Transforming Growth Factor-Beta 455

Kenji Kishi, James N. Ihle, David L. Urdal, and Makio Ogawa. Murine B-Cell Stimulatory Factor-1 (BSF-1)/Interleukin-4 (IL-4) Is a Multilineage Colony-Stimulating Factor That Acts Directly on Primitive Hemopoietic Progenitors 463

Craig C. Orlowski, Steven D. Chernausek, and Richard Akeson. Actions of Insulin-Like Growth Factor-I on the B104 Neuronal Cell Line: Effects on Cell Replication, Receptor Characteristics, and Influence of Secreted Binding Protein on Ligand Binding 469

Olle Larsson, Carolyn Latham, Peter Zickert, and Anders Zetterberg. Cell Cycle Regulation of Human Diploid Fibroblasts: Possible Mechanisms of Platelet-Derived Growth Factor 477

Deryk Loo, Cathleen Rawson, Angela Helmrich, and David Barnes. Serum-Free Mouse Embryo Cells: Growth Responses In Vitro 484

S.F. Gorfien, F.K. Winston, L.E. Thibault, and E.J. Macarak. Effects of Biaxial Deformation on Pulmonary Artery Endothelial Cells 492

E.E. Qwarnström, S.A. MacFarlane, and R.C. Page. Effects of Interleukin-1 on Fibroblast Extracellular Matrix, Using a 3-Dimensional Culture System 501

Hiroyuki Mioh and Jan-Kan Chen. Differential Inhibitory Effects of TGF-β on EGF-, PDGF-, and HBGF-1-Stimulated MG63 Human Osteosarcoma Cell Growth: Possible Involvement of Growth Factor Interactions at the Receptor and Postreceptor Levels 509

Edward J. Macarak, Stephen Gorfien, and Rob Roy MacGregor. Modulation of Endothelial Fibronectin Synthesis by Polymorphonuclear Granulocytes 517

Jonathan Blay and Morley D. Hollenberg. Epidermal Growth Factor Stimulation of Prostacyclin Production by Cultured Aortic Smooth Muscle Cells: Requirement for Increased Cellular Calcium Levels 524

Ralph M. Böhmer. Interaction of Serum and Colony-Stimulating Factor for Survival of a Factor-Dependent Hemopoietic Progenitor Cell Line 531

John H. Miller and Lisa N. Heath. Growth, Enzyme Activity, Sugar Transport, and Hormone Supplement Responses in Cells Cloned From a Pig Kidney Cell Line LLC-PK_1 538

J. Lynn Cutts, Terrence J. Scallen, John Watson, and Arthur D. Bankhurst. Role of Mevalonic Acid in the Regulation of Natural Killer Cell Cytotoxicity 550

Michael H. Kroll, George B. Zavoico, and Andrew I. Schafer. Second Messenger Function of Phosphatidic Acid in Platelet Activation 558

Michael Stoker. Effect of Scatter Factor on Motility of Epithelial Cells and Fibroblasts 565

Corinne M. Gajdusek and Sheila Carbon. Injury-Induced Release of Basic Fibroblast Growth Factor From Bovine Aortic Endothelium 570

Tohru Sawanobori, Hideo Takanashi, Masayasu Hiraoka, Yoshitaka Iida, Kazuaki Kamisaka, and Hidenori Maezawa. Electrophysiological Properties of Isolated Rat Liver Cells 580

ROBERT J. FITZSIMMONS, JOHN R. FARLEY, W.R. ADEY, AND DAVID J. BAYLINK. **Frequency Dependence of Increased Cell Proliferation, In Vitro, in Exposures to a Low-Amplitude, Low-Frequency Electric Field: Evidence for Dependence on Increased Mitogen Activity Released Into Culture Medium** **586**

DOUGLAS R. SPITZ, MICHAEL A. MACKEY, GLORIA C. LI, JAMES H. ELWELL, MICHAEL L. MCCORMICK, AND LARRY W. OBERLEY. **Relationship Between Changes in Ploidy and Stable Cellular Resistance to Hydrogen Peroxide** **592**

DIETER PAUL, BYOUNG S. KWON, MARTIN HÖHNE, RALF TÖNJES, ASIFA K. HAQ, AND BIRGIT HOFFMANN. **Establishment and Partial Characterization of SV40 Virus-Immortalized Hepatocyte Lines of Normal and Lethal Mutant Mice Carrying a Deletion on Chromosome 7** **599**

KENJI YAMATO, ZIAD EL-HAJJAOUI, AND H. PHILLIP KOEFFLER. **Regulation of Levels of IL-1 mRNA in Human Fibroblasts** **610**

GARY R. GROTENDORST, YOSHINAO SOMA, KAZUHIKO TAKEHARA, AND MARC CHARETTE. **EGF and TGF-alpha Are Potent Chemoattractants for Endothelial Cells and EGF-like Peptides are Present at Sites of Tissue Regeneration** **617**

NICHOLAS A. SAUNDERS, KENNETH F. ILETT, AND RODNEY F. MINCHIN. **Pulmonary Alveolar Macrophages Express a Polyamine Transport System** **624**

E.W. BLACK, T.L. CORNWELL, T.M. LINCOLN, S.J. STRADA, AND W.J. THOMPSON. **Fura 2 Analysis of Cytosolic Calcium Regulation in Elutriated Rat Gastric Parietal Cells** **632**

SIEGFRIED W. PRENNINGER AND GLORIA C. LI. **Will Heat-Stable Proteins Nonspecifically Protect Cells From Thermal Stress?** **641**

KOHICHIRO TSUJI AND TATSUTOSHI NAKAHATA. **Stochastic Model for Multipotent Hemopoietic Progenitor Differentiation** **647**

BIRGIT HOFFMANN, ANGELIKA PIASECKI, AND DIETER PAUL. **Proliferation of Fetal Rat Hepatocytes in Response to Growth Factors and Hormones in Primary Culture** **654**

Index to Volume 139 . . . . . **663**